DOCUMENT RESUME

ED 477 091 IR 021 819

AUTHOR	Schuch-Miller, Diane M.
TITLE	Virtually There: Online Case Studies.
SPONS AGENCY	National Science Foundation, Arlington, VA.
PUB DATE	2002-06-00
NOTE	7p.; In: ED-MEDIA 2002 World Conference on Educational Multimedia, Hypermedia & Telecommunications. Proceedings (14th, Denver, Colorado, June 24-29, 2002); see IR 021 687. Figures contain illegible type.
CONTRACT	EEC-9630951
AVAILABLE FROM	Association for the Advancement of Computing in Education (AACE), P.O. Box 3728, Norfolk, VA 23514. Tel: 757-623-7588; e-mail: info@aace.org; Web site: http://www.aace.org/DL/.
PUB TYPE	Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	*Case Studies; Distance Education; Employment Experience; Engineering; *Engineering Education; Engineering Technology; *Manufacturing; *Online Systems; Postsecondary Education; Professional Continuing Education; Special Degree Programs

ABSTRACT

The candidates enrolled in one of three degree programs offered through the Greenfield Coalition (GC) have a unique learning situation where classroom exercises link with their job experience. Situated at the Focus: HOPE Center for Advanced Technologies, candidates work in a real manufacturing production environment by day and attend courses by night. In order to export these experiences to students enrolled in other manufacturing engineering programs, GC developed case studies accessible online. Cases currently available support courses in engineering economics, statistics in manufacturing product launch, forming technologies, and tool and fixture design. A wealth of resources including interview transcripts, WWW links, raw data and expert advice are accessible online for learners to investigate each case and complete the required tasks. Includes six figures. (Author)

Reproductions supplied by EDRS are the best that can be made
from the original document.

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

G.H. Marks

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

Minor changes have been made to improve reproduction quality.

Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Virtually There: Online Case Studies

Diane M. Schuch-Miller, Greenfield Coalition, Wayne State University, USA, *schmild@focushope.edu*

ED 477 091

Abstract: The candidates enrolled in one of three degree programs offered through the Greenfield Coalition (GC) have a unique learning situation where classroom exercises link with their job experience. Situated at the Focus: HOPE Center for Advanced Technologies, candidates work in a real manufacturing production environment by day and attend courses by night. In order to export these experiences to students enrolled in other manufacturing engineering programs, GC developed case studies accessible online. Cases currently available support courses in engineering economics, statistics in manufacturing product launch, forming technologies, and tool and fixture design. A wealth of resources including interview transcripts, WWW links, raw data and expert advice are accessible online for learners to investigate each case and complete the required tasks.

The Need for Online Case Studies at Greenfield Coalition

The candidates (Greenfield Coalition (GC) students) at the Focus: HOPE Center for Advanced Technologies (CAT) have a unique learning environment. They have an advantage over students enrolled in traditional manufacturing engineering curricula because they have the daily opportunity to apply new concepts learned in the classroom to real situations on the manufacturing shop floor. This characteristic of the curricula at the Greenfield Coalition is not only unique but also provides a natural contextual environment for the application and transfer of new knowledge and skills. In terms of teaching and learning, a better environment could not be simulated. Therefore, it became a crit ical component of the teaching and learning strategies at GC.

However, in order to share this advantage and paradigm with other students enrolled in similar engineering programs so that they might learn from the experiences of the CAT candidates, GC had to somehow export these experiences. Presenting case studies from the CAT in an online environment seemed the obvious choice.

The Value of Case Studies

Case studies are ideal for illustrating complex concepts, especially common in engineering. Horton (2000) suggests the use of case studies as an excellent way for learners to practice judgment skills necessary in real life situations that are not as simple as textbook problems. As instructional strategies are concerned, engaging critical thinking skills through case studies is among a recommended set of activities (Bonk & Reynolds, 1998).

GC has developed several case studies that challenge learners in ways a manufacturing engineer would. The majority of the case examinations come from real situations faced by Focus: HOPE and other industry partners of GC (such as Society for Manufacturing Engineering, Ford Motor Company, General Motors, and DiamlerChrysler). One case developed as a capstone experience in engineering economics involves identifying the source of lost dollars for a tier one supplier to the automotive industry. Another case involves the redesign of a tie-rod end component used in the HMMWV (commonly known as the Hummer), whose primary customer is the U.S. Department of Defense. As part of a course in Integrated Product Realization, a case requires learners to apply processes and procedures for the launch of a new product. Yet another case supporting a course on statistics in manufacturing requires the analysis of variances of post-production part specifications in order to utilize statistical methodologies to explain scrap lost dollars. Many other cases have been developed by GC to support courses in tool and fixture design, forming technologies, operations management and facilities design. These cases require students to identify appropriate processes to apply in various situations, generate cost/benefit information and make appropriate decisions on the basis of that information, respond to requests for bid for a formed part, investigate and recommend solutions to eliminate tolerance irregularities during machining of parts as well as many other tasks typically found in manufacturing engineering environments.

Through these case studies, learners get practice applying newly learned skills and knowledge to authentic situations not found textbooks.

IR021819

BEST COPY AVAILABLE

Online Environment for Case Studies

In the online environment, GC has captured a wealth of resources related to each case and provides it for learners to examine and contemplate much like a student could do if s/he were enrolled in an onsite course. These resources are organized by typical activities that would be performed, to prevent the learner from feeling overwhelmed at any given time during the case analysis.

Case Study Orientation

The home page for the case serves as the learner guide. From this page, students are able to view the recommended set of investigation activities, expectations for assessment of their investigation as well as the full list of resources provided for their perusal. Basic navigation, similar to GC courses, is accessible at any time, from the left-hand side and across the top of the interface, providing constant availability of broad level course information. Further, the web interface is organized to keep learners from becoming frustrated or lost. Figure 1 shows that once a case is selected, the specific scenario is depicted, and instructions and activities are outlined. One level up, at the module level, it is possible to link to several case studies that all meet the same objective and, therefore, would be grouped into the same learning module.

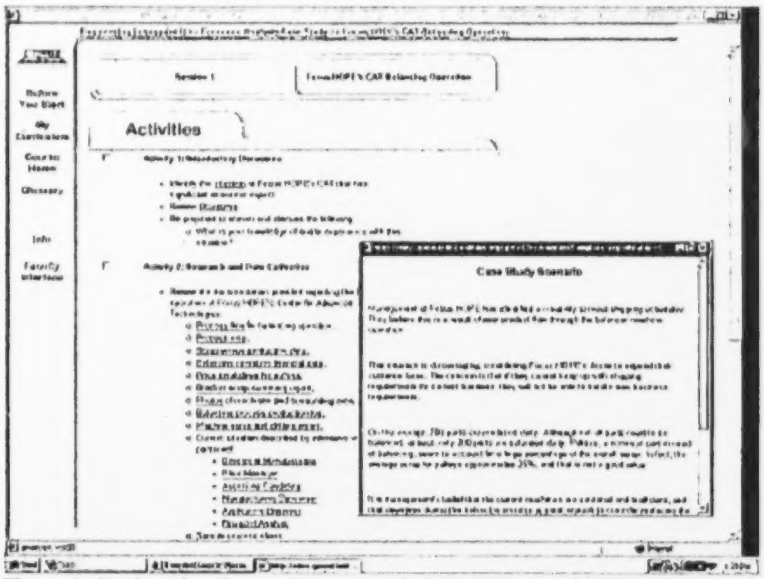

Figure 1: Engineering Economics case analysis home page with Situation pop-up

Learner Responsibility

Given the situation or scenario description, it is the responsibility of the learner (or team of learners) to investigate and uncover what they believe to be the real problem. Students are challenged to determine what is relevant to the case and process its importance. Exploring the resources helps them achieve this . While each case has a different set of resources, many media formats are used throughout all of the GC cases. In a case examining the scrap rate through the balancing operation for pulleys, a process map and product path are depicted using still images with mouse-overs for additional information (see Figure 2 & 3). Further, MSWord and Excel documents such as part price data, scrap rates and subsequent lost dollar reports are viewable in the web browser (see Figure 4).

BEST COPY AVAILABLE

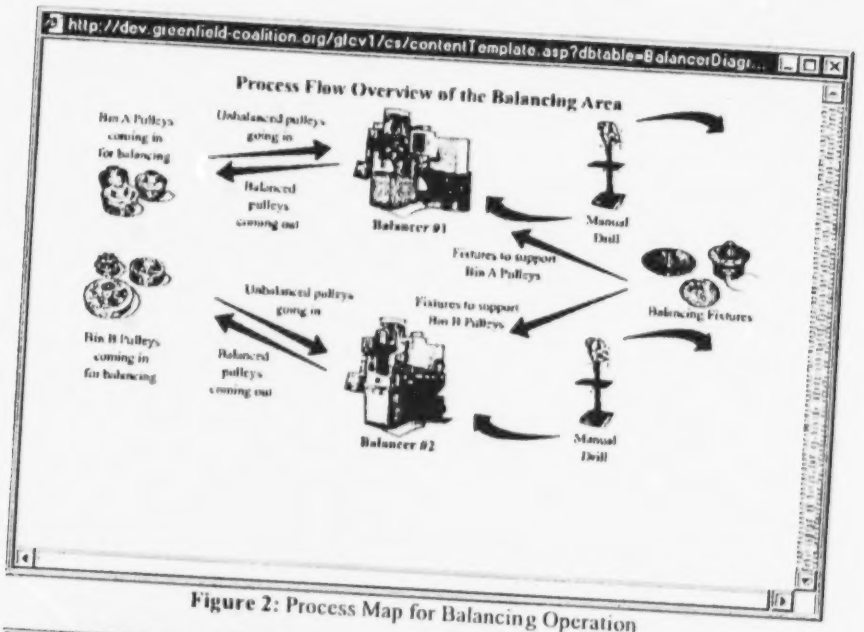
http://dev.greenfield-coalition.org/glcv1/cs/contentTemplate.asp?dbtable=BalancerDiagr...
Process Flow Overview of the Balancing Area
Bin A Pulleys coming in for balancing
Unbalanced pulleys going in
Balanced pulleys coming out
Balancer #1
Manual Drill
Fixtures to support Bin A Pulleys
Balancing Fixtures
Bin B Pulleys coming in for balancing
Unbalanced pulleys going in
Balanced pulleys coming out
Fixtures to support Bin B Pulleys
Balancer #2
Manual Drill

Figure 2: Process Map for Balancing Operation

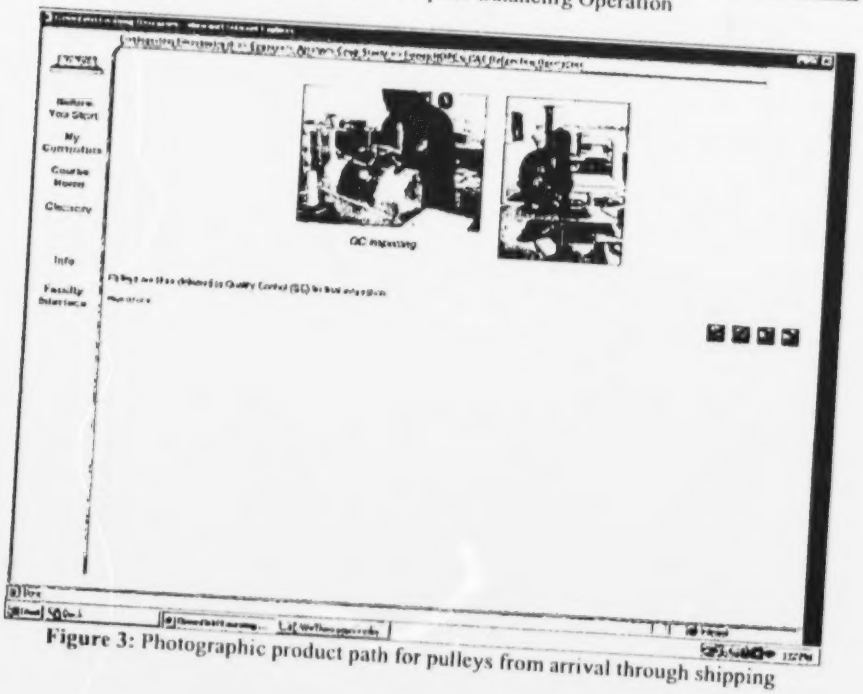

Figure 3: Photographic product path for pulleys from arrival through shipping

BEST COPY AVAILABLE

Figure 4: Sample data document for Boring Dimensional Irregularities case study

Students can even simulate a conversation with important personnel by reviewing the interview section of the resources. Here, streaming video clips and transcripts of real interviews conducted by CAT candidates can be viewed (see Figure 5). WWW links to vendors of balancing machines and/or information about new balancing technology make it possible for learners to research new technology or uncover how other companies resolved similar situations (see Figure 6).

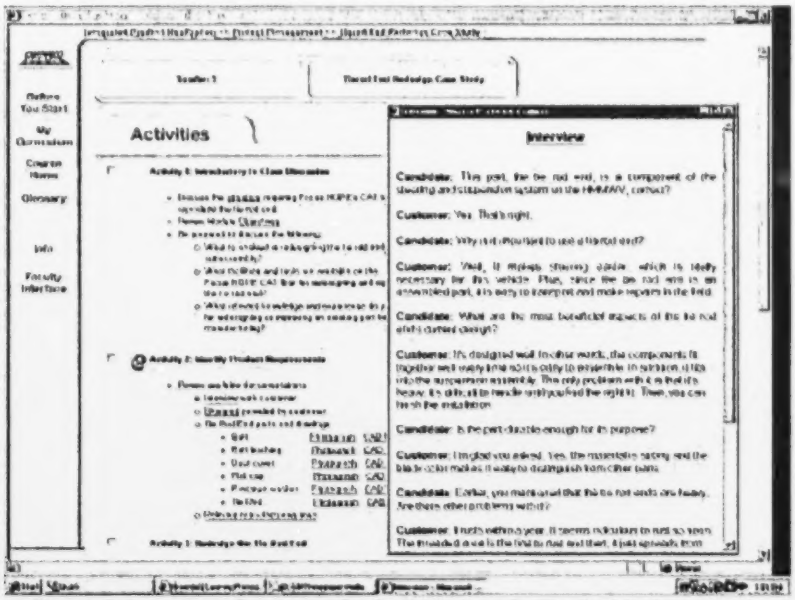

Figure 5: Interview of customer for the Redesign of a Tie-Rod End case study

BEST COPY AVAILABLE

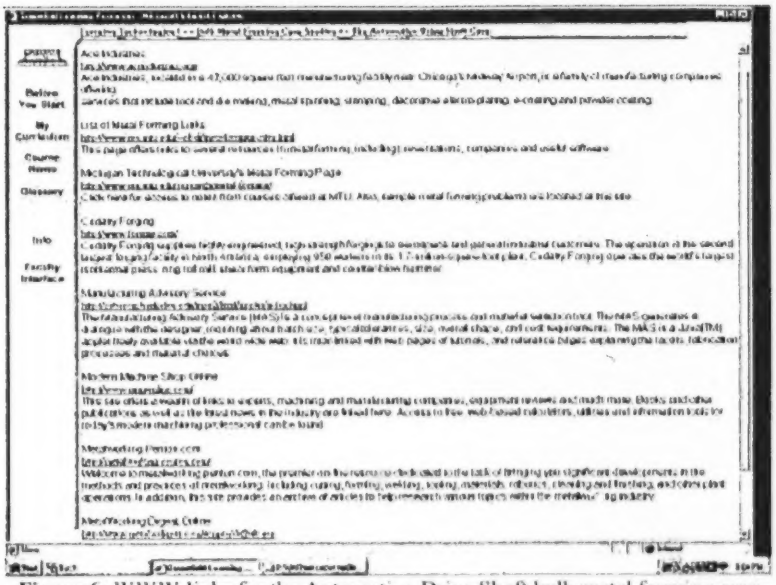

Figure 6: WWW links for the Automotive Drive Shaft bulk metal forming case

Recommendation for Resolution

Once the learner(s) has investigated the case thoroughly, s/he must prepare a report aligned with the guidelines for that specific case. For Engineering Economics, this report requires a comprehensive economic analysis of the situation and related data, and must include the student's recommendation for resolution to the problem. Supporting documentation such as a decision tree and sensitivity analysis also complement the report.

Although not explicitly required for each subsequent delivery of this case, a presentation to Focus: HOPE management was a component of the pilot of the economics case study. The experience of presenting the alternatives to the stakeholders made the needs of the client perfectly clear to the candidates and had a greater learning impact than initially expected. They were able to better understand the urgency for resolution and the impact in terms of time and money that implementing any one of the alternatives would cost. At the pleasure of the instructor using these materials, this experience could be simulated for other cases by simply asking classmates or industry experts to pose as the customer.

Supporting Teaching and Learning In The Online Environment

Learner Support

If, at any time, the learner feels overwhelmed by the rich set of information provided and feels that the exploration through the resources seems unproductive or inefficient, they may consult the mentor notes. Mentor notes, a series of tasks and issues related to the case and its objectives, serve as a tour guide and give necessary learner support when they need and want it. The learner is not required to follow the tasks and/or consider the issues in a lock-step fashion. Rather, Mentor Notes help to orient the learner to the items necessary for consideration in a thorough investigation of the situation. Filipczak (1996) refers to this as scaffolding or "guided discovery", by retaining learners opportunity to explore while still making certain that the established objectives are attainable. Candidates may choose to execute all, some, or none of the suggested tasks. Additionally, this compilation of expert notes can be applied to many situations. As a result, it functions as a tool for learning as well as a job aid for real manufacturing engineering situations.

Often case studies at GC serve as a capstone for the courses, however, they are not tests. Therefore, learners may refer to the mentor notes as often as necessary without negative consequence. The most important purpose is

BEST COPY AVAILABLE

that students can apply previously learned concepts and principles, and practice decision-making and problem-solving processes in a non-threatening but very real situation.

Instructor Support

Scaffolding is also provided for the course instructor in an area entitled Faculty Interface, in the event that the instructor using the case study materials is not as knowledgeable about a particular topic as the case study designer and/or developer. These notes, similar to the mentor notes, were recorded during the pilot offering of the case study to assist subsequent instructors adjusting to their new roles as a facilitator of learning and a manufacturing plant supervisor posing a variety of questions and concerns common in a real engineering setting.

Integration with Other Instructional Methods

It is critically important to be aware that the use of the web-enabled case studies does not occur without the leadership of an instructor. The instructor at GC plays several roles simultaneously: traditional instruction of course concepts, mentoring and coaching during the case investigation, and finally that of a supervisor challenging the recommendations from a manufacturing enterprise perspective (Schuch-Miller & Plonka, 2001). Moreover, follow-up classroom discussions, an integral component of the case design, allow learners to reflect, summarize and solidify their own learning and structure it in a way that is meaningful to them (Hidi & Anderson, 1986).

At GC, we strongly believe in a blended approach to teaching and learning, involving the integration of instructor-facilitated classroom activities, sharing of manufacturing experiences of the candidates at the CAT, bestowing course credit for experiences on the shop floor as well as utilizing the web-enabled technology wherever possible in order to enhance manufacturing engineering education. The result is a very fulfilling learning experience that includes learner collaboration, learner support, and innovation. By replicating these experiences in an online environment, it is hoped that other instructional programs can be enriched by using these resources as well.

For more information about Greenfield Coalition or the case studies discussed in this paper, access the following website: www.greenfield-coalition.org

References

[1] Horton, W. (2000). *Designing Web-Based Training*. New York, NY: John Wiley & Sons, Inc.

[2] Bonk, C. J., & Reynolds, T. H. (1998). Learner-Centered Web Instruction for Higher-Order Thinking, Teamwork, and Apprenticeship. In B. Khan (Ed.), *Web-Based Instruction*, 167-178.

[3] Filipczak, B. (1996). Engaged! The Nature of Computer Interactivity. *Training*, 33 (11), 52-58.

[4] Schuch-Miller, D. & Plonka, F.E. (2001). Emulating Real-World Engineering Experiences Using Web-Enabled Case Studies. Proceedings of the 2001 International Conference on Engineering Education, Oslo, Norway.

[5] Hidi, S., & Anderson, V. (1986) Producing written summaries: Task demands, cognitive operations and implications for instruction. *Review of Educational Research*, 56, 473-493.

Acknowledgment

The Greenfield Coalition is partially supported by a Grant EEC-9630951 under the Engineering Education Coalitions Program at the National Science Foundation. Focus:HOPE, our industry and academic partners have contributed valuable resources to support the development of Greenfield.

BEST COPY AVAILABLE

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

NOTICE

Reproduction Basis

[X] This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.

[ ] This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").